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सिन्टरित धातु सामग्रियां तथा कठोर-धातुयें — यंग मापांक ज्ञात करना

Indian Standard

SINTERED METAL MATERIALS AND HARDMETALS — DETERMINATION OF YOUNG MODULUS

UDC [669-138·8 + 669·018·25] : 620·172·22 : 539·32

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

June 1993

Price Group 1

Powder Metallurgical Materials and Products Sectional Committee, MTD 25

NATIONAL FOREWORD

This Indian Standard which is identical with ISO 3312 : 1987 'Sintered metal materials and hardmetals — Determination of young modulus', issued by the International Organization for Standardization (ISO), was adopted by the Bureau of Indian Standards on the recommendations of the Powder Metallurgical Materials and Products Sectional Committee (MTD 25) and approval of the Metallurgical Engineering Division Council.

The text of ISO Standard has been approved as suitable for publication as Indian Standard without deviations. Some terminology and conventions are, however, not identical with those used in Indian Standards. Attention is especially drawn to the following:

a) Wherever the words 'International Standard' appear, referring to this standard, it should be read as 'Indian Standard'.

b) Comma (,) has been used as a decimal marker while in Indian Standards the current practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appears to ISO 2738. The Indian Standard IS 5642 : 1991 'Permeable sintered metal materials — Determination of density, oil content and open porosity (*second revision*)', which is identical with ISO 2738 : 1987, is to be substituted in its place.

In reporting the results of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'.

Indian Standard

SINTERED METAL MATERIALS AND HARDMETALS—DETERMINATION OF YOUNG MODULUS

1 Scope and field of application

This International Standard specifies a method for the determination of the dynamic (adiabatic) Young modulus by longitudinal oscillations of sintered metal materials and hardmetals.

2 Reference

ISO 2738, *Permeable sintered metal materials—Determination of density, oil content and open porosity.*

3 Principle

Excitation of ultrasonic longitudinal oscillations in a test piece and determination of the resonance frequency of its natural oscillations.

4 Symbols and units

Symbol	Designation	Unit
L	Length of test piece	mm
Q	Density	g/cm^3
f	Frequency of natural oscillations	Hz
E	Young modulus	N/mm^2

5 Apparatus

5.1 Fixture, for mounting test piece.

5.2 Ultrasonic oscillator, having a continuous control of frequencies in the range from 20 to 100 kHz.

5.3 Device, for determining resonance frequency.

6 Preparation of test pieces

6.1 The test pieces shall be at least 60 mm long and may have either a round or a rectangular cross-section. The test piece with round cross-section shall be 6 ± 0,2 mm in diameter. The cross-section of the rectangular test piece shall be (6±0,2) mm × (8±0,2) mm.

6.2 The surface layer shall be removed to a depth of at least 0,1 mm. The surface roughness shall be $R_a \leqslant 1{,}25$ µm.

6.3 The ends of the test piece shall be ground and shall be parallel to within 0,02 mm.

6.4 The test piece shall be free of surface cracks or other structural defects and shall be cleaned immediately before being tested.

7 Procedure

7.1 Determine the density of the test piece to the nearest 0,01 g/cm^3 according to ISO 2738.

7.2 Measure the length of the test piece to the nearest 0,1 mm.

7.3 Mount the test piece in the apparatus. Smoothly increase the frequency of the oscillator until the lowest frequency of the natural longitudinal oscillations of the test piece is obtained. Determine the resonance frequency to the nearest 50 Hz.

8 Expression of results

8.1 Young modulus is given by the following equation:

$$E = 4 \times 10^{-9} \times L^2 \times Q \times f^2$$

8.2 Report the result rounded to the nearest 5×10^3 N/mm^2.

9 Test report

The test report shall include the following information:

a) reference to this International Standard;

b) all details necessary for identification of the test sample;

c) the result obtained;

d) all operations not specified by this International Standard, or regarded as optional; and

e) details of any occurrence which may have affected the results.

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